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ABSTRACT

Project EFFECT (Energy for the Future: Education, Conservation, Training) was a three-year experimental program in curriculum development focusing on energy conservation, technology, and training. It had three objectives: (1) create a comprehensive training program for adults without previous technical training, applicable to community energy conservation needs; (2) define the new occupational role of and provide training to the Energy Extension Agent; and (3) heighten community awareness of energy conservation. Advisory committees participated directly in curriculum development and in identifying and developing the employment market. Instructors from a wide variety of fields developed nineteen modules in four basic areas of classroom-based instruction: general background, technical training, energy audits preparation, and community education (see Note). A procedural guidebook for conducting energy use surveys was prepared. With the help of three CETA (Comprehensive Employment and Training Act) agencies, twenty-four trainees were recruited for a pilot training course including six months of classroom-based instruction and a two-month practicum. Ten of sixteen course-completers were employed in positions directly related to their training in energy technology. (Exhibits include a list of competencies of the energy extension agent and a core curriculum outline.) (YLB)

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Project EFFECT

Energy For the Future: Education, Conservation, Training

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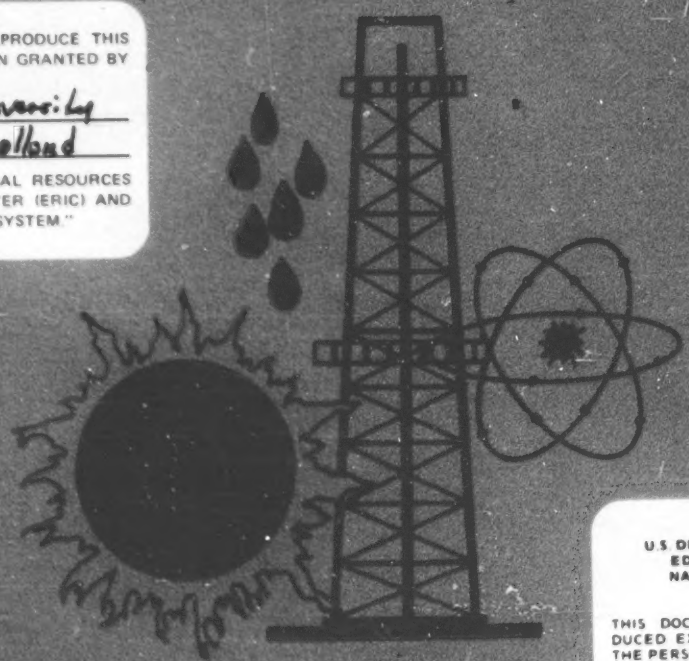

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INDIANA UNIVERSITY AT SOUTH BEND CENTER FOR ENERGY CONSERVATION

CE 025 099

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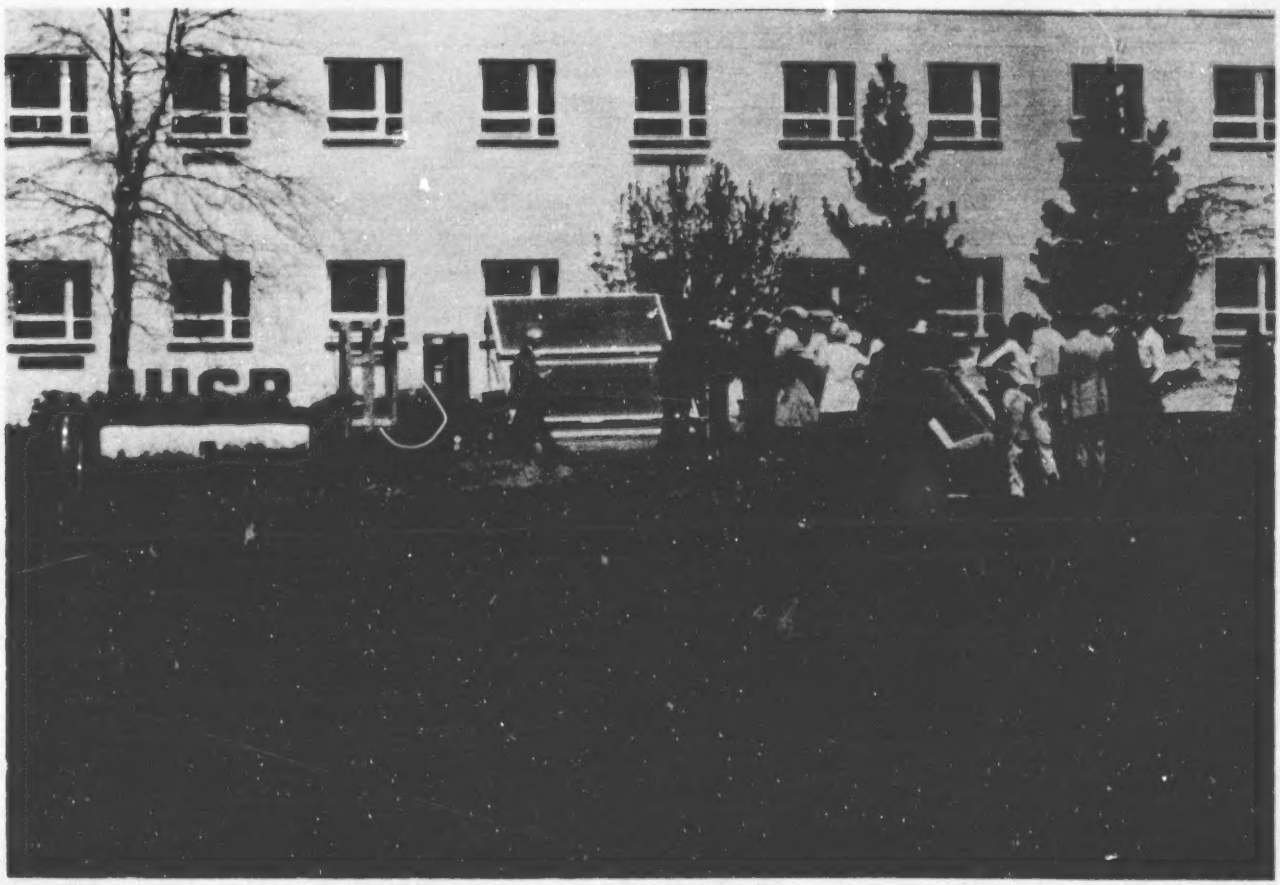


INTRODUCTION AND BACKGROUND

Project EFFECT (Energy For the Future: Education, Conservation, Training) was conceived from the need to address two interrelated national priorities -- the growing need for a trained cadre of energy conservation technicians, and an equally important need to educate the public about the present energy situation in the United States as it relates to our finite energy resources. It became obvious to the University that a curriculum was needed for training technicians who could assist engineers and architects in assessing energy use and the potential ways of saving resources. The demand for such manpower will be even greater because of the 1978 National Energy Act, which offers incentives to administrators of schools, hospitals, and health care facilities, as well as to state and local governments and private residents, if they perform energy audits of existing facilities.

While the audit can identify energy inefficiencies and potential savings, it cannot by itself solve the energy problem. Reaching a solution requires a deliberate choice by every citizen to become more energy conscious. In the past, consumers have made their decisions to purchase heating/cooling systems, appliances, and other energy consuming devices without first-hand information about energy consumption. What is needed now, in order to change the attitudes and habits of those who use too much, is reliable, unbiased information and accessible consultants.

Project EFFECT is a three-year experimental program in curriculum development focusing on energy conservation, technology and training. This interdisciplinary effort was launched by the Division of Arts and Sciences, which provided scientific expertise to help develop the concept, as well as academic coordination throughout the project; the Division of General and Technical Studies, which provided much-needed resources in vocational and technical education and training; and the Division of Continuing Education, which has the experience and expertise in developing manpower training and educational programs in a nontraditional framework and extensive experience in adult education, which this Project required. These three divisions collaborated in creating the project proposal. The Division of Education and the Division of Business and Economics also were most generous with aid and advice throughout the length of the project.

Project EFFECT was designed to meet the needs of adults throughout the North Central Indiana region by providing a model for vocational education and for delivery of specific energy conservation resources and materials. The secondary focus was on recruiting and training underemployed or unemployed adults. These persons seemed to be the most appropriate candidates because they comprise a group of representative citizens, and a training program that had worked effectively with them would probably be workable in other communities and with other groups.

By its very nature, Project EFFECT is unusual because it develops a curriculum concept while training participants in a new occupation. Specific innovations include:

- Developing a new occupation currently absent but highly appropriate to regional and national conservation needs;
- Using innovative teaching methods such as video-tape, media, "hands on" practicum, contact with professional practitioners, energy simulator, workshop simulation and verbal exchange to convey complex information to students without traditional educational backgrounds;
- Training adults with highly diverse skills, but without technical backgrounds, to perform complex technical procedures;
- Combining, in one training program, modules designed to develop competencies in technical areas such as drafting and life-cycle costing and community education.

OBJECTIVES

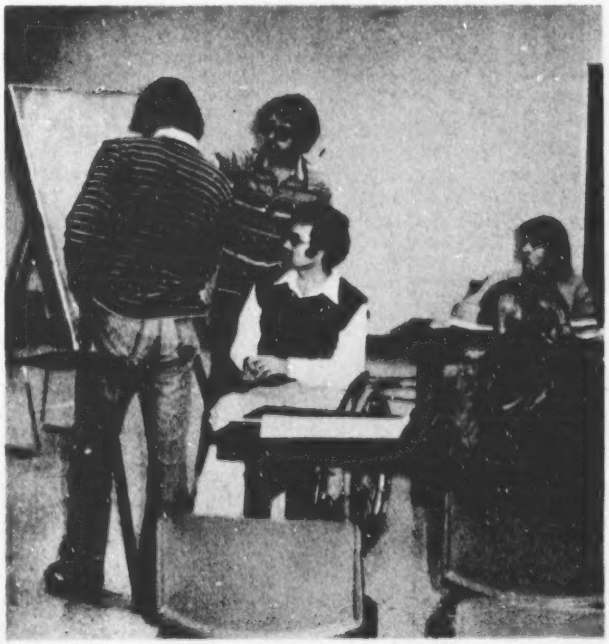
In its effort to address the need for technically trained manpower and informed citizens, Project EFFECT developed objectives in the three basic areas of Curriculum Development, Training, and Community Education, as follows:

1. To create a comprehensive training program for adults without previous technical training, applicable to community energy conservation needs, and usable in other communities in a variety of regions.

2. To define the new occupational role of Energy Extension Agent and to provide training for this agent, who would become a new community resource.

3. To heighten community awareness of energy conservation.

Basic graphics for students ". . . without technical backgrounds."



CURRICULUM DEVELOPMENT

Developing and testing a new curricular model for training adults without previous technical experience was the Project's major objective. The following components played an integral part in reaching this goal:

Curriculum Advisory Committees: Representatives of major utility companies, government agencies, industrial and academic communities, service organizations, and unions were included in these committees. These persons included experts from the industrial and commercial sectors that would be most affected by a new entry in the labor force. This was particularly true in the areas of manpower needs and job development. The members participated directly in curriculum development and in identifying and developing the employment market.

This panel of experts contributed significantly in the search for answers to such questions as:

- the ramifications of developing a new vocational area;
- the possible hiring obstacles in established commercial organizations;
- the relevance of specific modules to potential on-the-job situations;
- the comprehensiveness of module content.

A special Community Education subcommittee developed a multi-phase community education module covering public relations, consumer education and community agencies.

In addition, the Advisory Committee has helped keep the community informed about the project, provided public relations support, and advised staff about ways to distribute promotional materials. The members have also recommended and helped recruit instructors from the professional community.

The advisory committees were major contributors to the core curriculum. Without their input, significant portions of the curriculum might have been overlooked or handled in insufficient depth. In addition to ensuring the curriculum's relevance, the committees enhanced the project's credibility and the ultimate marketability of Energy Extension Agents.

R. Werner demonstrating insulation materials on model.

Instructors, selected on the basis of recognized talent and experience in a wide variety of fields, were identified and recruited from IUSB and the greater Michiana region. Their areas of expertise ranged from the basic sciences to commercial and industrial areas such as heating and cooling, and insulation. Each instructor was asked to submit a module using the standard project format, which included a statement of objectives for the module, teaching/learning activities and evaluation loans keyed to the objectives, a description of resources, and a cost estimate. The plan also included a syllabus that gave a session-by-session breakdown of the material to be covered. Staff worked with the instructor to formulate the plan and modify it when necessary.

Guest instructors and speakers represented state and local government, as well as key professions in the industrial and commercial sectors. They included the president of the St. Joseph County chapter of ASHRAE (American Society of Heating, Refrigeration and Air-Conditioning Engineers), the director of the Energy Conservation Division of the Building Council of Indiana, the State Building Commissioner, representatives of the U.S. Department of Energy, Office of Education, and the Indiana State Energy Group.

Guests brought their own practical and specialized perspectives to the program, and students were particularly interested in their comments about job opportunities. The curriculum's development and modification has reflected suggestions of regular instructors and guest speakers, as well as recommendations from the advisory committees and students.

Advice from nonacademic persons to the instructional staff was of great importance. These contributors provided a practical, pragmatic view that effectively counterbalanced the more theoretical approach of classroom instruction. In addition, both academic and nonacademic instructors were highly responsive to feedback from students and Project staff.

Curriculum Modules were employed in order to allow both independent and integrated instruction. Each module is designed to develop competencies in a particular area and to ensure an integrated curriculum. This guarantees that basic skills are developed early, and modules that are taught concurrently have a logical relationship to one another. Nineteen modules developed in four basic areas of classroom-based instruction comprised the first six months of the eight-month program. These basic areas included:

I. General Background
II. Technical Training
III. Energy Audits Preparation
IV. Community Education

A two month practicum following the classroom portion of the curriculum included:

I. Field Observations
II. Community Education Workshops
III. Energy Use Surveys

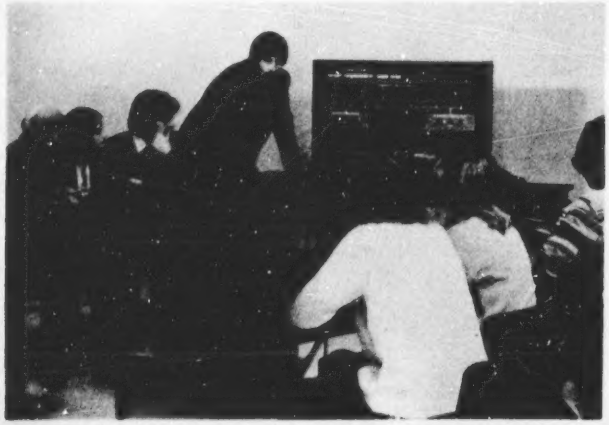
This practicum, described more fully in the section on training which follows, affords students the opportunity to observe professionals in related fields on the job.

The Curriculum Guide for Training Energy Extension Agents, volume i, was prepared as a working draft for the purpose of evaluation and revision in preparation for the second year of instruction and training. Two companion volumes are *Supplementary Materials,* volume ii, which includes complete module plans, copies of resource materials, bibliographies, and examinations; and a *Procedural Guidebook for Conducting Energy Use Surveys,* volume iii, which contains detailed explanations and examples of procedures necessary for conducting Energy Use Surveys (Audits) of residences and light commercial structures. The Curriculum Guide contains objectives for each module with teaching/learning activities, resources, and evaluation keyed to the objectives as well as syllabi containing descriptions of content on a class-by-class basis.

Procedural Guidebook for Conducting Energy Use Surveys: Investigation of various materials and methods for training energy auditors disclosed that not only were training resources extremely scarce, but there was little agreement about what an energy audit actually entailed. Before students could be taught to conduct an audit or energy use survey, as it came to be called, the auditing process had to be developed. Academic Coordinator Neil Weber and Technical Coordinator Robert Werner first addressed the questions "What is an audit? What should it measure? How can the energy efficiency of a structure be described in terms that the layman, as well as the technician, can use?"

Beginning with the existing data from Project Retrotech, the Federal Energy Administration Home Weatherization Manual, and materials such as the ASHRAE Manual, 1972, Werner and Weber designed a systematic approach to energy auditing that has been recognized as a prototype in the field. Similar to the modular approach to curriculum design, the systematic audit breaks a structure into its energy-using components: heating, cooling, lighting, hot water, and miscellaneous appliances. The energy efficiency of each system is tested, and a report is produced wich includes efficiency data, recommendations for energy-saving changes, estimated payback time and return on investment. The guidebook continues to evolve, as staff and trainees experiment with the process and some of the sections have been computerized for greater efficiency and precision.

"... innovative teaching methods such as ... energy simulator ..."



Curriculum Evaluation Workshop: A select group of participants was invited to South Bend in November, 1978, to attend a day and a half workshop devoted to intensive critiquing. Participants were drawn from Federal sources, from those engaged in similar work in Indiana and in Region V DOE, and from individuals with expertise in manpower needs assessment, curriculum, and energy conservation technology. These persons were placed in task forces to discuss:

1. Manpower needs in light of new Federal energy legislation;
2. Curriculum modules, individually, and as they related to one another;
3. Next steps in curriculum development, including short courses and seminars, as well as continuing education and follow-up of Year I graduates.

curriculum, its dissemination and its evaluation. Many have been incorporated into the Year II program. Developing the labor market for Energy Extension Agents was given high priority and participants stressed that manpower needs assessment and job development should be closely related to energy legislation requirements.

TRAINING

A pilot training class was recruited to test the viability of the experimental curriculum with the cooperation of three CETA agencies in the region -- St. Joseph and Elkhart Counties and the City of South Bend. The admissions criteria were a high school diploma or GED; the ability to function at the eighth grade level or above in mathematics and reading as measured by the Test of Adult Basic Education (TABE); and a successful interview, which indicated that the candidate had the interest and motivation necessary for completing the demanding eight-month training program.

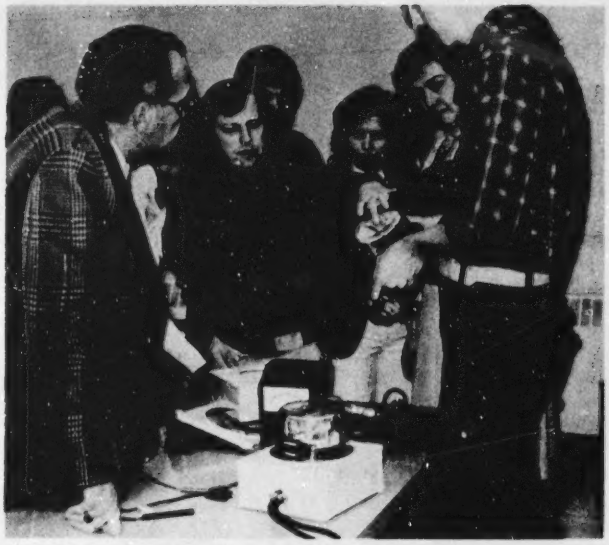
After initial screening and testing by the CETA agencies, candidates were interviewed in November, 1977, by two Project staff members and a CETA representative. The interview focused mainly on the candidates' general background, work history, and reasons for interest in the program.

The 24 trainees ranged in age from 18 to 54 and had varied backgrounds. Four held high school GED's and nine had one or more years of post-secondary education. Weekly evaluation sessions permitted the trainees to respond immediately to the week's materials and instruction. They understood that EFFECT was an experimental curriculum and that they were the first to be trained in a new occupation. This pioneering opportunity was a source of pressure and also of pride as they realized that their reactions were being incorporated into the evolving curriculum.

Instruction Schedule: Trainees attended classes from December 5, 1977, through July 28, 1978, five days a week, seven hours per day. The program's intensive nature made regular attendance and complete attentiveness a necessity, as students normally studied up to five different modules in any one week. A day missed could mean making up work in as many as three different modules.

Classroom-based Instruction: During the first six months of instruction, students spent most of their time in IUSB's classrooms and laboratories. Major field trips were taken to Cook Nuclear Plant, Twin-Branch Power Plant (steam generating) and Bailey Power Plant (coal-burning), where students got a first-hand look at three different ways of generating power. Other "hands-on" activities included "mapping" several University buildings for graphics assignments, using instruments for measuring energy use, measuring light levels, and testing furnance efficiency in the Center for Energy Conservation.

Practicum: The final two months of training consisted of experiences which gave students the opportunity to put into practice what they had learned in the classroom. The first month was tightly scheduled with observations and closely supervised energy surveys or audits. During observations, interaction was often on a one-to-one basis as students had the opportunity to accompany field representatives for Indiana and Michigan Electric Company, Northern Indiana Public Service Company (natural gas suppliers), ACTION, INC. weatherization crews, Insulating Engineers, Inc. crews, South Bend Building Inspectors, St. Joseph County Health Department representatives, and I.U.S.B. Engineering



"... using instruments for measuring energy use."

Department personnel. Students kept detailed accounts of their observations, documenting and assessing how professionals in energy technology performed their tasks. At the same time, the hosts were asked to rate the students on their level of participation and questioning, knowledge, ability to meet the public and general level of interest. The hosts submitted confidential evaluations after all student observations.

During the supervised audits, instructors worked with small teams surveying at least two residences, giving directions as students took measurements and made the necessary calculations. As students provided their competence, direct supervision decreased until they were able to qualify as "independent auditors." Students were then required to do one to three independent audits, depending on the level of their performance. Students, at minimum, had to meet the "independent auditor" competency requirement and do one complete audit.

Concurrently, students prepared and delivered workshops on energy conservation in South Bend and Elkhart. Workshops were delivered at ACTION, INC., South Bend, for staff and weatherization crews; at Project RENEW, a mandatory education program for community members who need help finding new housing; and at H.O.M.E. in Elkhart, an ACTION agency, for staff and case workers.

Pre-test/Post-test: During the second day of orientation week, students were given a one-hour energy "pre-test" covering representative materials from all of the instructional modules to determine each individual's level of knowledge and awareness in the energy field. Questions checked the students' ability to perform such tasks as identifying the local utilities, defining technical terms and computing energy use. The same exam was administered again at the end of the project

Results were as expected: pre-test scores were generally poor, with a class mean of 30.7%. Scores ranged from 10% to 74%. Only five students scored above 28%. Post-test scores were substantially higher, with the mean rising to 76.26% and a range of 63% to 98%.

Evaluation of General Student Performance on all the modules was recorded on individual record sheets listing all assignments and exams. Students were given grades of Excellent, Adequate, Needs Improvement and were required to achieve a grade of Adequate on each module in order to complete the program. Individual conferences were held regularly to keep each student informed of his or her progress. Student feedback during these sessions was included in the record.

Evaluation of Training - Student Critique: Students and staff met weekly for evaluation sessions covering level, pace, and methods of instruction, course content and intra-group relations. Recommendations for changes in the instruction methods were implemented as soon as possible, keeping the curriculum responsive to student concerns.

Success and Attrition: Of the 24 original students, 16 were presented with "Certificates of Completion." Of those who did not complete, one found employment and three dropped out for personal reasons. The remaining four were terminated for reasons that included absenteeism, unacceptable academic performance and problems with interpersonal relations.

PLACEMENT

Placement activities began in June and continued through November, 1978.

Preparation: Advisory committee members, the Chamber of Commerce and professional and business organizations were contacted for advice concerning the potential employment market and the needs for various types of manpower in energy conservation technology.

Students were prepared for the job search through counseling and practical sessions on resume writing, interviewing techniques and job readiness. A placement coordinator was retained on a consulting basis to work on manpower needs assessment, job development and trainee preparation.

Employment: Of the sixteen graduates, ten are employed in positions directly related to their training in energy technology, including one who is employed by Project EFFECT as Curriculum Development Associate. The other positions include: Housing Inspector for Housing Allowance; ACTION, INC., Materials Coordinator; a draftsman doing heating and cooling calculations for an Engineering Consulting firm, an auditor for an Energy Auditing firm; and a free lance energy audit consultant for an architect. Three have left the immediate area and the remaining three are employed in positions unrelated to energy.

Follow-up: First year Project graduates are being tracked to determine job performance, adequacy of job-related training, and need for continuing education. Short courses for graduates are a part of the continuing Project plan.

COMPETENCIES OF THE ENERGY EXTENSION AGENT

Technical Skills enable the graduate to conduct an energy use survey of a residential or light commercial structure, which includes:

- .....a simple sketch of the structure, including plan and elevation views, showing all relevant details;
- .....an exact accounting of heat losses and heat gains due to infiltration and conduction through floors, ceilings, windows and walls;
- .....an analysis of existing insulation and ventilation and recommendations regarding the need for more or less of each;
- .....a full description of heating, cooling, hot water, lighting and appliance systems;
- .....a two year billing audit which considers fuel consumption and cost for space heating and cooling, domestic hot water, electrical equipment and other appliance systems;
- .....consultation with homeowners to recommend possible energy conservation opportunities, in order of priority, and the payback period on these investments.

Communication Skills enable the graduate to conduct an energy conservation workshop for community, professional and lay organizations, which includes:

- .....information on energy conservation methods (a breakdown of energy uses in the home, from largest to smallest, in terms of energy consumption and suggestions on how to cut down on usage);
- .....displays of different types of insulation with R-values on each and recommended usage of each;
- .....charts showing R-values on various materials and water usage in a typical home;
- .....general information on alternate energy sources;
- .....general discussions on energy related questions generated from the audience as a result of information presented.

Displays illustrating energy conserving materials.

CORE CURRICULUM

DIDACTIC INSTRUCTION (6 MONTH)

SECTION I - General Background

Module	Hours
Alegebra Review	16
Technical Writing	10
Energy Overview	88
Total	114

SECTION II - Technical Training

Module	Hours
Basic Graphics and Blueprint Reading	93
Building Codes and Engineering Guidelines	20
Building Materials and Processes	24
Electricity	13
Introduction to Cooling Systems	26
Introduction to Heating Systems	40
Instrumentation	21
Insulating Materials and Techniques	22
Lighting Efficiency	20
Regional Weather	18
Total	297

SECTION III - Energy Audit Preparation

Module	Hours
Energy Cost Calculations	15
Energy Use Survey: Procedure and Techniques	36
Total	51

SECTION IV - Community Education

Module	Hours
How to Conduct Community Energy Education Projects	80
Neighborhood and Community Organization	16
Regional Demography	14
The Organization of State and Local Government	16
Total	126

PRACTICUM (2 MONTHS)

SECTION I - Field Observations	27
SECTION II - Community Education Workshops	54
SECTION III - Energy Use Surveys	111
Total	192
Plus 6 month didactic	588
Complete Training Program = (Core Curriculum)	780

COMMUNITY IMPACT AND PUBLIC DISSEMINATION

Students were prepared for delivering energy conservation information in the community through activities that would supply practical experience and knowledge. Activities included giving workshops for social agencies, setting up a resource center, coordinating SUN DAY activities in South Bend, conducting energy audits, and developing a mass mailing of Project brochures with follow-up of returns.

Project staff participated in developing a bill in the South Bend Common Council which proposed an Energy Conservation Commission for South Bend. A staff member now sits on the Board of this Commission. Staff also worked with the U.S. Department of Energy Region V states in developing the Midwest Energy Education Consortium.

The Center for Energy Conservation is a national resource center for private citizens who need information on energy related problems; for governmental agencies and educational institutions that are interested in training guidelines and consultation in order to set up programs of instruction in energy conservation technology in their localities.

SUN DAY, May 3, 1978, was coordinated in South Bend by Project EFFECT on the I.U.S.B. campus. Included were demonstrations of working model solar collectors that are used for domestic water heating, and examples of homemade solar equipment. Students from local public schools displayed solar science projects and Project EFFECT students were available to answer questions about the viability of solar power as an alternate energy source. EFFECT students also made and staffed displays illustrating various types of energy conserving materials and techniques and distributed solar and energy conservation materials.

Energy Use Surveys were conducted by trainees during the practicum. Citizens volunteered to have their homes audited during the SUN DAY activites and, in some instances, made special requests for this service.

Community Workshops, as noted above, were conducted by trainees at Project RENEW and ACTION, INC. in South Bend and H.O.M.E. in Elkhart, an ACTION agency.

These workshops were the culmination of the students' community education preparation through which students designed and delivered "mini-workshops" for their peers and then revised and expanded their materials for the public. They were required to administer all phases of the workshop plan, including setting objectives, planning physical logistics, and preparing handouts, demonstration materials and evaluations.

Professional Meetings and Conferences with others in this field created productive working relationships which have helped the Project generate and share new information in the field of energy conservation technician training. This, in turn, led to improvements in the curriculum. Disseminating information about Project EFFECT has proved to be the most valuable way to keep abreast of the "state of the art" as others in the field respond to information about our efforts.

EXTERNAL EVALUATION

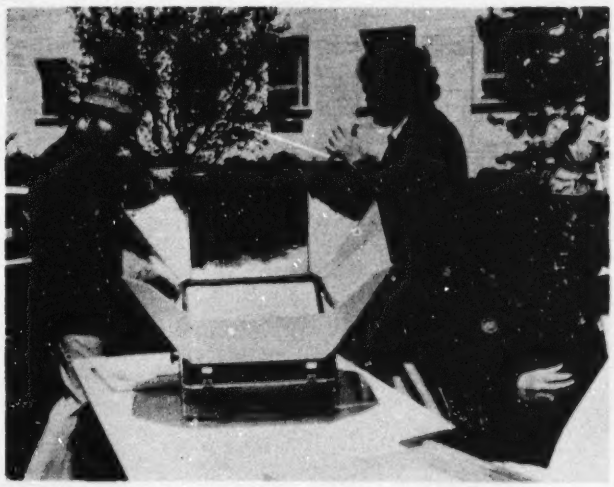
The external evaluator's role is to determine and document whether the objectives of Project EFFECT are being met, and how well, and to provide technical assistance in coordinating the third-party evaluation with the project's internally-directed evaluation processes.

The general procedures included:

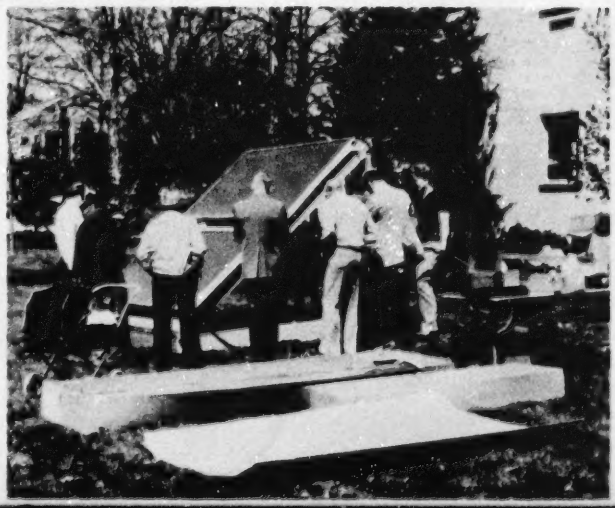
1. reviewing all documentation and curricular data generated by the project;
2. making four site visits, including interviews and group conferences with the staff and with trainees and community resources in the South Bend municipal area and throughout St. Joseph and Elkhart Counties.

The five major components to be evaluated were: 1. students, 2. curriculum, 3. community impact, 4. dissemination, and 5. project management. The evaluator worked closely with Project staff in making recommendations and suggesting methods for their implementation. Many of his suggestions have been incorporated into the Year II program.

Solar grill, an ". . .example of working solar equipment."



". . . working model solar collector. . .for heating water."



FUTURE ACTIVITIES

Curriculum Development and Training:

Using the Curriculum Guide prototype as a starting point, the training program materials will be further refined, revised and re-evaluated. A major improvement will be the opportunity to work with computerized audit procedures. The background of the second year group of trainees is somewhat different than that of those in Year I. Year II students represent a broad range of perspectives and only one-third of them are CETA supported. In general, they have somewhat more education and more personal experience in the energy area. They are a motivated, challenging group, who will put the curriculum and the training program to a severe test as they learn and question. The curriculum, as a result, is expected to be even more flexible and adaptable than it was at the end of Year I.

Short Course Development:

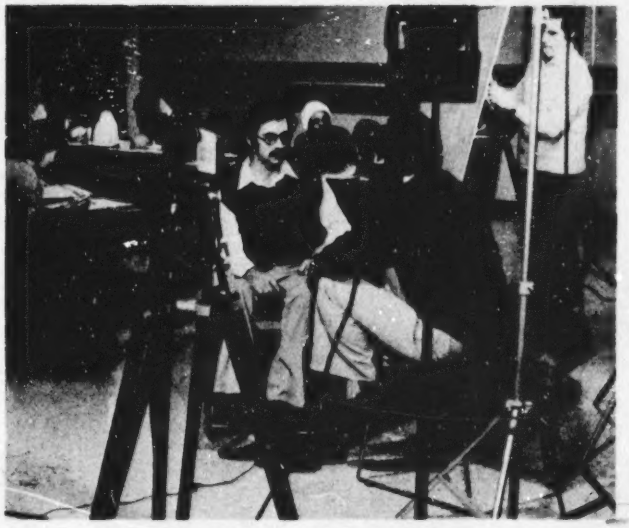
Modules developed for the eight-month curriculum are being adapted for use in seminars, workshops and short courses for specialized groups. Pilot workshops and short term training are being planned for:

South Bend School Corporation Administrators and Maintainance Engineers
Northern Indiana Regional Plenning Commission
Indiana and Michigan Electric Company
Northern Indiana Public Service Corporation (natural gas suppliers)
ACTION, INC.
Year I Project graduates (Continuing Education)
The Northwest Neighborhood Home Owners' Association of South Bend members
Pokagon State Park pilot audit project - Indiana State Department of Natural Resources

Conferences/Dissemination:

Two major conferences will be held in addition to the November, 1978 Curriculum Evaluation Conference.

A regional workshop/conference focusing on "Energy Audits: Content, Structure and Training" will take place in September, 1979. Its purpose is to help interpret and meet the 1978 Federal Energy Act's guidelines for auditing schools, hospitals and public buildings. School and hospital administrators, government officials and directors of public and social service agencies from the Michiana area will be invited to participate. A conference, in November, 1979 will focus on energy education and training and will build on the concept of the pilot Curriculum Evaluation Conference held in November, 1978. The audience will represent programs throughout the nation, and exemplary projects will be showcased and discussed in workshops. It will be directed toward community colleges, vocational and technical schools, and related educational programs.



". . . innovative teaching methods such as. . . video-tape. . ."

Student evaluation: ". . . a challenging group."

CONCLUSION

The development of a training curriculum in Energy Conservation Technology - the overriding reason for Project EFFECT - was the major focus of effort. To maintain this primary focus, the all activities involved with Training and Community Impact had to be designed with the consideration, "How will this contribute to curriculum development?" Even those activities which seemed most peripheral to actual curriculum development - for example, personal counseling and readiness for job seeking affected the ultimate production of the curriculum. The pace and scheduling of activities, as well as the content and level of materials, were considered in the attempt to plan a curriculum that would be effective and usable with trainees from a wide variety of backgrounds - people with varying needs and motivation. Information dissemination and conference activities were geared toward sharing with others to learn from their comments how the curriculum could be improved. Project EFFECT looks forward to meeting the new challenges offered in the second and third Project years, particularly as the curriculum in both long and short forms is tested in a variety of settings.

SCHEDULE OF ACCOMPLISHMENTS AND TARGET DATES